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MEXICAN, SOUTHEASTERN AND SOUTHWESTERN RELATIONSHIPS AS SEEN FROM THE STANDPOINT OF THE SPREAD AND ORIGIN OF DOMESTICATED PLANTS

by R.S. MacNeish
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One of the clearest ways - I believe - to see the influences and relationships between Meso-America and the rest of North America is to examine the diffusion and spread of domesticated plants from the north to south, and south to north. Up until recently, Mexico has given us little concrete botanical data to help us with the discerning of contacts between the two areas. Future work however in more Mexican caves will undoubtedly bring more crucial data to bear on this problem. Nevertheless, recently in Tamaulipas we have uncovered a large quantity of domesticated plants that - I believe - will have some bearing upon when and how and where certain contacts took place between Meso-America and the rest of North America. ~~This~~ These data on domesticated plants, an 8,000 or 9,000 years' sequence, when compared with other cave material and archaeological material from both the Southwest as well as the Big Bend area, Northwest Mexico, and the Eastern United States, is, surprisingly enough, quite informative as to possible routes of contacts and possible times of contacts.

However, before we go into the problem of the origin and spread of these plants, I believe it is necessary first to briefly review our sequence in northeastern Mexico. The area in which these plant remains were uncovered was in the southern part of the state of Tamaulipas, the northeastern-most state of Mexico. Culturally, our area is in the northeastern periphery of Meso-America. Much of this area is semi-desert as to vegetation and rainfall, but fingers of the tropical climate extend into it from the south. In terms of topography, the eastern part along the Gulf is flat; then the coastal flats give away to hills and canyon-cut mountains of the Sierra de Tamaulipas;

further west are the lower hills in the Guayalejo valley, which border the edge of the still steeper Sierra Madre of southwestern Tamaulipas.

We worked in this area for a number of seasons, in 1945 and 1946 we did a little survey in the area and some minor excavations in some of the ruins in the Sierra de Tamaulipas. In 1948 and 1949 we uncovered a long sequence from three stratified caves as well as two stratified ruins in the Sierra de Tamaulipas and found about 120 sites belonging to nine cultural phases.

In 1954 more archaeological reconnaissance was undertaken in the Sierra de Tamaulipas and two more sites were excavated. However, most of our work in 1954 was in the Sierra Madre. Here we found about another hundred sites and excavated three caves that had almost a completely unbroken sequence. In the following chart I shall indicate the stratigraphy and the sequences of our two areas.

As may be seen from this chart, there are some obvious gaps in our sequence and because of this I felt that it is necessary to combine the two sequences from the Sierra de Tamaulipas and the Sierra Madre. This will give us a more or less unbroken sequence from about 9,000 to about 1,800 years ago. And also there will be domesticated plants from almost all parts of this sequence.

Now let me briefly review the cultures as to their subsistence patterns in this combined sequence. Though in the Sierra Madre we have two very early cultures, one called the Diablo complex which is perhaps older than 12,000 years and the Lerma phase which is probably between 9,000 and 10,000 years old, it is with the Infernillo horizon, 7,000 to 9,000 years ago, that we obtain our first clear picture of ancient subsistence. These remains included abundant vegetable materials. 50% to 75% of the food stuffs are from wild plant collecting, while 45% to 20% are from hunting. The remainder, less than 5%, are from incipient agriculture of pumpkins, peppers, and in the later stages gourds. Agave, opuntia and runner beans (all potentially domesticable) were collected along with the other wild remains.

The next stage in our sequence is filled by Nogales and probably the early part of Ocampo. This is roughly from 5,000 to 3,000 B.C. From 70% to 80% of their subsistence was based on plant collecting and plants collected included panicum sonorum, runner beans, agave, opuntia, all of which could be domesticated, but were not. Domesticated plants make up from 5% to 8%, and they include gourds, chili, large and small varieties of pumpkins, and yellow-seeded varieties of beans. In some of the feces there were a few pieces of corn silk and some pollen. Thus corn was known at this date, but whether it was domesticated or not is not discernable.

The next period from 3,000 to 2,300 B.C. is represented by the Perro and late Ocampo remains. About 15% of their food came from animals, roughly 70% to 76% came from wild plants, including amaranthus, panicum, setaria, phaseolus coccinius, opuntia, tripsicum and agave. There is a fairly wide range of domesticated plants, though they only compose from 10% to 15% of their diet. These include gourds, two varieties of squashes, peppers, long red-and yellow-seeded varieties of beans, two varieties of an early race of corn called Early Mil-tel.

The Flacco and Almagre phase are the most similar from any of the two areas and these probably occurred from roughly 1,800 to 2,200 B.C. Their subsistence is very much the same as that of the latter period only with a little more agriculture, that is about 20% and this is at the expense of plant collecting. One minor botanical difference is that Bat Cave corn is to be found in the Sierra Madre; otherwise it is pretty much the same.

Developing out of the Flacco phase is the Guerra phase in the Sierra Madre which is represented by only six components (four of them not very good) though it did contain abundant vegetable materials. Carbon-14 dates suggest that it existed for a short period from 1,800 to 1,400 B.C. Domesticated plants included gourds, peppers, pumpkins of two varieties, corn cucurbita moschata (that is warty squash), yellow and red beans, as well as cotton, and so forth. This composed about 30% of their diet, while only 10% came from meat and the rest was from wild plants.

The Guerra phase developed into one called the Mesa de Guaje. It is estimated that it was occurring from 1,400 to 500 B.C. This is represented by even fewer components. Bat Cave and hybridized corn, teocentli, cotton and possibly sunflowers, yellow and red-seeded beans, warty squash, pumpkins, peppers, gourds and so forth composed the agricultural assemblage.

The period developing out of Mesa de Guaje (called La Florida) was only found in survey on the Sierra Madre, but it seem very similar to Lagunas of the Sierra de Tamaulipas which had domesticated plant remains. These people were basically agriculturists with 40% of their subsistence coming from these activities, 51% from plant collecting and about 9% from hunting or trapping of animals. Domesticated plants included gourds, pumpkins, manihot, pepper, beans (large red variety), cottons, three races of hybridized corn Breve de Padilla, Bait-Bacal and Nal-Tel and possibly earlier Nal-tel (unhybridized) types. (Possibly the other plants found in Mesa de Guaje exist at this stage also but our sample was too small to determine this).

This late Formative Phase is directly ancestral to Xalabones of the Sierra de Tamaulipas which overlaps with early Palmillas of the Sierra Madre roughly from 0 to 500 A.D. Since only Palmillas had preserved vegetal remains our reconstruction is based upon these materials. Domesticated plants included several varieties of corn, pumpkin, moschata and mixta squash, gourds, chili peppers, probably tobacco, runner beans, sunflowers, panicum, amaranths, manihot, lima beans, six varieties of common beans and cotton. Domesticated plants represented about 45% of their diet and wild plant collecting 50% while the remainder was from hunting or trapping of animals.

La Calta (500 to 900 A.D.) developed from Xalabones and if we can judge from late Palmillas remains which are very similar, it would seem that these subsistence patterns were about the same.

In the Sierra Madre, San Lorenzo developed from Palmillas but the regional equivalent has not been found in the Sierra de Tamaulipas. San Lorenzo 900-1300 A.D. has most of the domesticated plants of Palmillas but some of the varieties of Zea Mays and Cucurbita pepo as well as panicum, teocentli and sunflower are missing. Furthermore, agricultural foods

represent only 40% of their diet while 10% is from meat.

The final period (1300 to 1750 A.D.) sees the Los Angeles Phase in the Sierra de Tamaulipas and San Antonio in the Sierra Madre. Both of these last into historic times. Study of food reveal that these people obtained 40% of their food from agriculture, 42% from wild food plants and 18% from animals they hunted or trapped. Variety of domesticated plants are limited to one or two varieties of corn and beans, peppers, one variety of pumpkin (cucurbita pepo) and squash (cucurbita moschata) gourds, cotton, tobacco, indigo and possibly canavalia beans. The following chart outlines the occurence of domesticated plant remains in the Tamaulipas sequence.

Having briefly reviewed the combined archaeological sequence of southern Tamaulipas, let us reiterate the sequence of domesticated or potentially domesticated plants. Agave, opuntia and phaseolus coccineus (runner beans) were used from the beginning of the sequence (9,000 years ago) and last up until historic times. There seems to be no evidence botanically that these were consciously planted or cultivated, though the plants were capable of such. Other plants capable of domestication, but for which we have no actual evidence that they were domesticated were panicum sonora (millet) that appear in feces from 5,000 B.C. through Palmillas 700 A.D., amaranths that occur in refuse and feces from Flacco (1,200 B.C.) times to historic times, and seeds and beans of manihot dulcis in the refuse from Laguna times (500 B.C.) through Palmillas times (700 A.D.). Also, occuring in the Laguna Phase were remains of bromelia which in certain parts of Mexico were planted as hedges and their acid fruits eaten. However, their rarity in the Tamaulipas remains strongly suggest they were not planted here and were collected along with other wild forms. Some pods that might possibly be Canavalia occurred with Los Angeles remains but whether they are Canavalia is not certain.

Now let us turn to the plants that actually seem to have been domesticated. Two of the earliest at 6,000 B.C. and leading to historic times are the gourd, (Lagenaria sic) and chili peppers, (capsicum frutescens). Both of these could have been useful weeds that were exploited but not planted. Some botanists, however, do not believe these plants occur wild, but are either domesticated or plants that one were domesticated and have returned to a wild state. As far as Tamaulipas is concerned, both are rare or absent in a wild state and very frequent in the archaeological remains. Thus I believe both were planted.

As early as these two plants are domesticated pumpkins (Cucurbita pepo). These first occur in early Infiernillo levels, perhaps 9,000 years ago and last until historic times. According to Whitaker and Cutler there were an increase of varieties of pumpkins until Palmillas times. Unfortunately our archaeological material was not complete enough for them to set up actual races of cucurbita pepo in their analysis. In rough outline the sequence of varieties was as follows. In the beginning there was a small (seeded) pumpkin. During Ocampo and La Perra times a slightly large seeded variety occurred with a narrow tapering peduncle. In Mesa de Guaje a wide-rimmed seed variety occurred and the greatest diversity was reached in Palmillas when one or more varieties occurred with not only different shaped seeds, but very different stems and body forms. Warty squash (cucurbita moschata) first occurred during Guerra times about 1,300 B.C. and walnut squash (cucurbita mixta) during Palmillas 300 A.D. Both lasted up until at least 1300 A.D.

Following the earliest peppers, squash and gourds, are beans (phaseolus vulgaris). The first beans are yellow seed variety (C 31) which occurs in early Ocampo about 4,000 B.C. which are shortly followed by a long red variety (C 33) about 3,000 B.C. These lasted up until historic times. Since, no wild beans have been found in Tamaulipas, it is assumed there were domesticated throughout their history even though in the earlier stages they were treated much like a wild plant, that is, pods and beans were chewed as quids and mainly green beans were utilized without being boiled. During Palmillas times 300 to 800 A.C. two other varieties of phaseolus vulgaris, a black bean (C 32) and a small red bean (C 33a), occurred along with lima beans (phaseolus lunatus).

Occuring only a short time after the first beans is corn (Zea Mays). Its use starts about 3,000 B.C. and it lasts until today. Here again, new or distinctive races appear at different time periods. Unfortunately only the

corn sequence from the Sierra de Tamaulipas has been completely studied through the many cobs from the Sierra Madre are undergoing analysis. The earliest races are Early Nal-tel A and B in Sierra de Tamaulipas at 3,000 B.C. though pollen and silk occur in earlier Ocampo feces. Some cobs that are either of the Bat Cave race or closely related occur at about 2,000 B.C. in the Sierra Madre. Occurring at about 1,500 B.C. were found a number of other varieties (races) of corn showing teocentli intergression as well as actual grain of teocentli (though examples of one of its ancestors, tripsacum, occurred much earlier). Between 500 B.C. and the time of Christ Nal-tel, Breve de Padilla, Zait-Bacal were found. Other races may occur in later phases, but by late Prehistoric and historic times Breve de Padilla type seems to have become dominant.

Besides these more well-known domesticated plants others occurred including: cotton (gossypium) from 1,800 B.C. to historic times; possibly sunflowers (helianthus) from 1,500 B.C. to 1,000 A.D. ; possibly tobacco from 300 A.D. to historic times (nicotiana rustica); (here I say possibly tobacco for the leaves and stem fragments in pipes and cigarettes are small and difficult to identify accurately); and finally, evidence from dyed indigo blue fibre of fragments of woven cotton cloth indicate indigofera suffruticosa was used in the period from 1,300 to 1,750 A.D.

Thus all in all twelve definite species or genera of domesticated plants occurred as well as more than sixteen races or varities of these species. Furthermore, seven species of genera occurred that could have been domesticated. In total there are at least 34 domesticable plant varieties in the 9,000 year sequence from southern Tamaulipas.

When these dated domesticated plants from Tamaulipas are compared with other tentatively dated plant remains from North and South America,

they throw considerable light upon the origin and diffusion of many New World plants. It is actually rather surprising how many areas have given us dated domesticated plant remains in the New World. First and foremost are those from South America, mainly coastal that is from Huaca Prieta and the other parts of the Peruvian sequence. Here we have a 5,000 year sequence of domesticated plants. Coming further north we have just a hint of domesticated plants from Santa Marta cave in Chiapas. In Central Mexico we have not found early domesticated plants. The next area further north which produced long cave sequences with plant remains is in northwestern Mexico in Sonora (Lister, 1956) and in north Central Mexico in Coahuila. The Southwest is, of course, abundant with preserved materials from caves; most of these are quite well dated. In the Hohokam area there is, of course, Ventana cave and Pine Bluff cave as well as others. In the Mollogon area there is Bat cave, Tularosa cave, Cordova cave, and the Hueco caves. Adjacent to the Mollogan remains are those from west Texas in the Big Bend area. Present work in this area is contributing valuable new important information. Turning westward from the southwest we have remains from Gypsum cave, Lovelock cave, and other California caves. None of these are again C-14 dated, though they contained a fairly limited amount of domesticated plant remains. Going eastward we have first the Caddo area. There are two sets of information from this general region, one being from the rock shelters of the Ozark Bluff dwellers, and the other being from charred remains in open Caddo sites. Northward, in the Great Plains our material is very limited being mainly charred material from at the earliest Sterns Creek and mainly Mississipi time period sites. The eastern United States again has produced relatively limited material. The earliest seems to come from the vestible of Mammoth cave in Kentucky and seems to be archaic, in other words, it is probably older that 2,000 B.C. Many of the other Kentucky

caves which Webb noted seem to be of the Adena time period. Other remains from the eastern United States come from open sites and are mainly charred materials, a few of which come from the Hopewell time level but most of them belong to the Mississippi time period.

Now let us take some of the domesticated plants from Tamaulipas, compare their occurrence with those from other parts of the New World, and see what they tell us about contacts between Meso-America and the United States. The first plant we shall take is the common gourd (Lagenaria sic). Whitaker and Cutler have indicated that its ultimate origin probably is in Africa and that it probably floated across the Atlantic Ocean and may have taken hold again in the soil along the edge of the Atlantic coast of the New World. As indicated in Tamaulipas it is at least 9,000 years old in the New World. In the eastern United States (if we can trust the Kentucky cave material) it is in the earliest levels, in Ramon Prieto it is in the earliest levels, and in the southwest of Bat Cave it is in the earliest levels. It is here suggested that probably even during the Pleistocene gourds were floating across from Africa and taking hold along the Atlantic coast, and that with the invasion of men to the Atlantic coast more than perhaps 9,000 years ago, they began to be used by a number of different groups in this vast area. Later their use spread from the Atlantic coast westward. Thus from our present data and in terms of the above hypothesis, this plant is of little use in discerning prehistoric contacts between Meso-America and North America.

Chili peppers, that is, capsicum frutescens, represent a somewhat similar problem. These are probably wild in the New World, and wild chili peppers are spread from the American southwest well down into Brazil in South America. These also occur in the earliest levels in South America and in the earliest levels in Tamaulipas. In other words, there is considerable reason to believe that these were one of the first food plants gathered and perhaps planted,

perhaps again more than 9,000 years ago. Dressler has suggested that they probably were indep[en]dently domesticated and used in a number of areas from Mexico down into Brazil. Certainly the archaeological evidence would seem to back this up. The plant itself, of course, needs very little cultivation and is actually treated very much like a wild berry anyway. Furthermore, the wild plant and the domesticated one are very difficult to tell apart, particularly from archaeological remains. Thus this plant is also not very useful in plotting contacts. This, also is true of amaranths that appear early in Mexico, the Southwest and the east, but may very well have been independently domesticated a number of times.

The next plant on our list, the pumpkin, that is cucurbita Pepo. (See Map). These occur in Tamaulipas at about 8,000 to 9,000 years ago. They do not occur early in South America, nor did we find any in the caves in Chiapas in southern Mexico. However, they do occur in the earliest levels in the southwest of Bat Cave. They do not occur in Levelock cave or other sites in the Great Basin. They are also absent from archaic remains in the Kentucky caves but do occur with Adena. Since cucurbita Texana is considered to be the most closely related wild plant and since it occurred between the southwest and Tamaulipas, I would guess this is the area of domestication. Our Tamaulipas materials, particularly the small seed variety, appear to be very close to the ancestral type and indicate Tamaulipas was close to the centre of origin of our first pumpkins. Thus, a date of 8,500 years ago is probably not too far from the actual date when they were first planted and domesticated. Somewhat confirming this hypothesis is their possible early occurence in the Big Bend area. I say possible because all I have is a verbal statement about the recent Big Bend excavation. I would guess, that by 3,000 B.C. large seed varieties

spread into the southwest, into the Hollogon area via the Rio Grande Route. About a 2,000 B.C. these remains moved eastward across Texas into the eastern United States, and southward to utilized in the so called Formative period of Mexico. Pumpkin also appears in the lower Missouri in Stern Creek culture, about 500 A.D. At a much later date, perhaps 1,000 A.D. they moved into northern Arizona (and perhaps the Hohokam area), and during Mississippi time moved out into the great plains. This is one of our best documented plants and also one, which I believe, we have some fair understanding of its origin and diffusion.

The history of beans, that is phaseolus Vulgaris, is not quite so well known. (See map). However, in this case an actual wild variety is known from Guatemala and southernmost Mexico. The early date of beans in Tamaulipas, that is about 4,000 B.C., suggests that beans were domesticated perhaps between 4,000 and 6,000 B.C. in the Guatemala highland region. Our early date in Tamaulipas suggests that in pre-Formative time, that is roughly 3,000 to 4,000 B.C., they had spread over much of Mexico. The Bat Cave materials suggest that by 1,000 B.C., they perhaps spread up from Tamaulipas via the Rio Grande into the Hollogon area of the southwest. However, their absence in Big Bend area at an early date may mean another route was used which was not along the west coast as they are also absent from Chihuahua and Sonora caves. About the time of Christ there was a further spread across Texas from the southwest into the eastern United States to appear in Hopewell. By about 1,000 A.D. they again moved northward; this time out into the Great Plains and into the Iroquois area in the eastern United States.

Warty squash (cucurbita moschata) represents an entirely different problem. (See Map) It occurred in Tamaulipas and Peru about the same time, that is about 2,000 B.C. This is earlier than anywhere else in the New World.

This suggests that its origin was somewhere between these two spots. As Dressler has stated, its greatest diversity is in Central America, and this may very well be its centre of origin; on the basis of the dates for Peru and Tamaulipas we might guess that it was domesticated and first planted in that area about 3,000 B.C. Then it spread north and south, reaching Tamaulipas by 2,000 B.C. and Huaca Prieta in Peru at about the same time. There are three possibilities as to what happened next. It may have spread into the southwest and via the Rio Grande route to reach the Anasazi via the Pecos River at about 1,000 A.D., and then after this date it probably spread southward into the rest of the southwest and also crossed Oklahoma and Arkansas to the Mississippi cultures in the eastern United States. Its absence in Mollogon, the Big Bend and its presence in the Ozarks make this unlikely. The second possibility that it was independently domesticated in the east and then spread to the southwest seems unlikely as it is absent in Adena. The most likely hypothesis is that it spread from Tamaulipas to the Caddo area about the time of Christ and then moved westward to the Arizona at 1,000 A.D., after that spreading to the rest of the east and southwest.

Now we come to the most important New World product, that is corn (zea mays.) (See map) This, of course, was the basis for all New World civilization and was really the most important agricultural plant. As yet, we know very little of its ultimate origin in spite of the fact that we have now found wild corn pollen in the valley of Mexico probably during the last part of the ice age. At present our earliest archaeological evidence seems to come from Santa Marta, Chiapas, in southernmost Mexico. Here a single cob of a generalised primitive pods of pop has been found in a layer between 5,000 and 6,000 years old. This hints that probably in the same area there are even

earlier types and that Chiapas is near the centre origin. The next earliest corn is to be found in Tamaulipas and the southwest of Sonora at about 5,000 years ago. The former is the early Nal-tel type, while at the latter from Sinaloa and New Mexico are similar pod-pop type which is called Bat Cave race. This suggests that the early Chiapas type became adapted to the mountains in one variety (the Bat Cave variety) and spread up to the western Cordilleron to New Mexico, while another variety of the early Chiapas type had become adapted to the lowland and spread up the Gulf coast to Tamaulipas. From 1,000 to 2,000 B.C., corn seems to have been spreading into western South America. At the same time, hybridised teocenti introgressed types began to appear in Mexico. These hybridised types in turn spread by about 1,000 B.C. to the southwest. By the time of Christ a special flint-type of corn became developed in the Basket-Maker culture of Northeastern Arizona, and this in turn crossed to the eastern United States and arrived in Hopewell area about the time of Christ. At about 500 A.D. Nal-tel spread from Tamaulipas to the Alto focus of east Texas, while further hybridised types are spreading from Mexico into the southwest from the western part of Mexico. After 1,000 A.D. eastern corn types spread into the northeast and up the Missouri into the Great Plains. Though we are a long way from knowing all the answers about the spread of corn, I think that now we have at least a vague outline of its movements.

The next plant on our list is cotton, gossypium. (see map) The earliest cotton that has been found sofar is at Huaca Prieta in coastal Peru, its date from about 2,500 B.C. Probably it is much older in this area. It does not appear in Tamaulipas until 1,700 B.C. Between 1,000 B.C and the time of Christ one movement of cotton seems to have extended

northward in the central plateau of Mexico into the southwest. Another finger, about the same time, may have moved from Tamaulipas across Texas to join the Hopewell and other Riffle woodland cultures of the eastern United States. Thus by the time of Christ, cotton seems to have reached its maximum distribution.

The next on our list as far as Tamaulipas is concerned is lima beans, that is phaseolus lunatus. (See map) Mackie has written quite a bit about the history of beans and seems to be correct in guessing that the place of origin was Guatemala. Our first beans in Tamaulipas appear between 1,500 and 1,000 B.C. Thus the first spread of beans from Guatemala seems to be northward over much of Meso-America. A second root seems to have between 1,000 and 500 B.C. down to Peru. At about the time of Christ still a third finger moves out from Guatemala, southward and along the Caribbean, into Venezuela and out into the Caribbean Islands. The Mexican varieties at about 500 A.D. move up the west coast to enter the Mogollon and Hohokam in the southwest. At about 1,000 A.D. lima beans spread northward into the Anasazi area of the southwest.

Sunflowers, that is helianthus, probably have their origin in the southwest (or between the southwest and the Ozark bluff dweller, if the few seeds from the Ozark Bluff actually are pre-Pottery). Sunflower seeds appear in the earliest level of Bat Cave which, I would guess, are about 3,000 B.C. (See map) I also would guess, that sunflowers first spread eastward into the eastern United States to appear in Adena and later in Hopewell. At about the time of Christ, sunflowers start their southward movement, arriving in Tamaulipas about 3,000 A.D. At a much later date, about 1,000 A.D. they probably move up the Missouri River into the Great Plains and also at the same time move into the northeastern United States.

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Walnut squash, that is cucurbita mixta occur in Tamaulipas and Ventana Cave in the southwest at about 300 A.D. (See map) On the basis of this distribution I would guess that somewhere about the time of Christ cucurbita mixta is domesticated in northwest Mexico. It probably spread from the Hohokam area into northeastern Arizona about 1,200 A.D., and at the same time was spreading out of northern Meso-America into Guatemala.

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The final plant we shall discuss is tobacco. (See map) The earliest tobacco that has been found so far is from Adena Caves in Kentucky where it occurs at about 1,000 B.C. Working on the assumption that elbow pipes were used for smoking tobacco, we might guess that during the Hopewell period about the time of Christ, tobacco spread all over all the eastern United States as well as up the Missouri River into the plains. At about 500 A.D., tobacco smoking may have moved from the Caddo area of Texas into northeastern Mexico and then spread into the rest of Mexico during the post-Classic period. Parallel with this movement would be a spread of tobacco from the eastern United States across Oklahoma and Kansas to the southwest at about 500 to 700 A.D. and then down the west coast in Mexico at 1,000 A.D. Still later, at perhaps 1,000 A.D., tobacco spread from Florida into the Caribbean Islands and perhaps from there (or Mexico) into South America. There is also one possible last prehistoric movement of tobacco at 1,500 A.D., from the Great Plains across the Rockies to the Northwest Coast.

SUMMARY (see charts)

Having rather sketchily outlined the hypothetical spread of a number of plants now let us look more closely at routes and times of contact between Mexico and the United States.

Route 1 - Southwest and Mexico via Rio Grande - This route seems to have been rarely used. In the two cases that it was employed it seems to have occurred early (before 4,000 B.C. and before 1,000 B.C.) The two plants involved are the pumpkin and sunflower and both look to be southwestern domesticates rather than Mexican ones.

Route 2 - The Mexican and Southwest Central Plateau Route - This route also seems to have been an early one. The Mogollon early beans and cottons seem to have definately travelled along it. Early corn and perhaps later hybridized varieties might have also spread via this way but the evidence is not conclusive and the little we do know seem to favor the western Mexico route.

Route 3 - The Tamaulipas - Central Texas Route seems to be a middle time period way of contact. At about the time of Christ squash seems to have moved northward along it. Perhaps cotton, also moved into the east via this avenue though the possibility that it moved eastward from the Mogollon must not be forgotten. Somewhat later Mal-tel corn moved from Tamaulipas to east Texas while tobacco and pipe smoking moved in the opposite direction.

Route 4 - Western Mexico seems to have been a possible avenue in old time periods which became most important in the late phases. Pod pop corn seem to have move along it early (before 2,000 B.C.) while

hybridized corn moved along a little later (1,000 B.C. to 0) At about 500 A.D. walnut squash and lima beans seem to have moved northward along this route. While after 1,000 A.D. sieva and runner beans may have moved northward along it while tobacco and pipe smoking moved south.

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One of the clearest ways - I believe - to see the influences and relationships between Meso-America and the rest of North America is to examine the diffusion and spread of domesticated plants from north to south, and south to north. Up until recently, Mexico has given us little concrete botanical data to help us with the discerning of contacts between the two areas. Future work however in more Mexican caves will undoubtedly bring more crucial data to bear on this problem. Nevertheless, recently in Tamaulipas we have uncovered a large quantity of domesticated plants that - I believe - will have some bearing upon when and ~~how~~ where certain contacts took place between Meso-America and the rest of North America. This data on domesticated plants, an 8,000 or 9,000 years' sequence, when compared with other cave material and archaeological material from both the Southwest as well as the Big Bend area, Northwest Mexico, and the Eastern United States, is, surprisingly enough, quite informative as to possible routes of contacts and possible times of contacts.

However, before we go into the problem of the origin and spread of these plants, I believe it is necessary first to briefly review our sequence in northeastern Mexico. The area in which these plant remains were uncovered was in the southern part of the state of Tamaulipas, the northeastern-most state of Mexico (See Map 1) Culturally, our area is in the northeastern periphery of Meso-America. Much of this area is semi-desert as to vegetation and rainfall, but fingers of the tropical climate extend into it from the south. In terms of topography, the eastern part along the Gulf is flat; then the coastal flats give away to hills and canyon-cut mountains of the Sierra de Tamaulipas;

further west are the lower hills in the Guayalejo valley, which border the edge of the still steeper Sierra Madre of southwestern Tamaulipas.

We worked in this area for a number of seasons. In 1945 and 1946 we did a little survey in the area and some minor excavations in some of the ruins in the Sierra de Tamaulipas. In 1948 and 1949 we uncovered a long sequence from three stratified caves as well as two stratified ruins in the Sierra de Tamaulipas and found about 120 sites belonging to nine cultural phases.

In 1954 more archaeological reconnaissance was undertaken in the Sierra de Tamaulipas and two more sites were excavated. However, most of our work in 1954 was in the Sierra Madre. Here we found about another hundred sites and excavated three caves that had almost a completely unbroken sequence. In the following chart I shall indicate the stratigraphy and the sequences of our two areas.

1. MacNeish, [illegible]
2. MacNeish, 1952
3. MacNeish, 1953

As may be seen from this chart, there are some obvious gaps in our sequence and because of this I felt that it is necessary to combine the two sequences from the Sierra de Tamaulipas and the Sierra Madre. This will give us a more or less unbroken sequence from about 9,000 to about 1,800 years ago. And also there will be domesticated plants from almost all parts of this sequence.

Now let me briefly review the cultures as to their subsistence patterns in this combined sequence. Though in the Sierra Madre we have two very early cultures, one called the Diablo complex which is perhaps older than 12,000 years and the Lerma phase which is probably between 9,000 and 10,000 years old, it is with the Infernillo horizon, 7,000 to 9,000 years ago, that we obtain our first clear picture of ancient subsistence. These remains included abundant vegetable materials. 50% to 75% of the food stuffs are from wild plant collecting, while 45% to 20% are from hunting. The remainder, less than 5%, are from incipient agriculture of pumpkins, peppers, and in the later stages gourds. Agave, opuntia and runner beans (all potentially domesticable) were collected along with the other wild remains.

The next stage in our sequence is filled by Nogales and probably the early part of Ocampo. This is roughly from 5,000 to 3,000 B.C. From 70% to 80% of their subsistence was based on plant collecting and plants collected included panicum sonorum, runner beans, agave, opuntia, all of which could be domesticated, but were not. Domesticated plants make up from 5% to 8%, and they include gourds, chili, large and small varieties of pumpkins, and yellow-seeded varieties of beans. In some of the feces there were a few pieces of corn silk and some pollen. Thus corn was known at this date, but whether it was domesticated or not is not discernable.

H. Callan

The next period from 3,000 to 2,300 B.C. is represented by the Perra and late Ocampo remains. About 15% of their food came from animals, roughly 70% to 76% came from wild plants, including amaranths, panicum, seteria, phaesolus coccinius, opuntia, tripsicum and agave. There is a fairly wide range of domesticated plants, though they only compose from 10% to 15% of their diet. These include gourds, two varieties of squashes, peppers, long red-and yellow-seeded varieties of beans, two varieties of an early race of corn called Early Nal-tel.

The Flacco and Almagre phase are the most similar from any of the two areas and these (probably) occurred from roughly 1,800 to 2,200 B.C. Their subsistence is very much the same as that of the latter period only with a little more agriculture, that is about 20% and this is at the expense of plant collecting. One minor botanical difference is that Bat Cave corn is to be found in the Sierra Madre; otherwise it is pretty much the same.

Developing out of the Flacco phase is the Guerra phase in the Sierra Madre which is represented by only six components (four of them not very good) though it did contain abundant vegetable materials. Carbon-14 dates suggest that it existed for a short period from 1,800 to 1,400 B.C. Domesticated plants included gourds, peppers, pumpkins of two varieties, corn cucurbita moschata (that is warty squash), yellow and red beans, as well as cotton, and so forth. This composed about 30% of their diet, while only 10% came from meat and the rest was from wild plants.

The Guerra phase developed into one called the Mesa de Guaje. It is estimated that it was occurring from 1,400 to 500 B.C. This is represented by even fewer components. Bat Cave and hybridized corn, teocentli, cotton and possibly sunflowers, yellow and red-seeded beans, warty squash, pumpkins peppers, gourds and so forth composed the agricultural assemblage.

The period developing out of Mesa de Guaje (called La Florida) was only found in survey n the Sierra Madre, but it seem very similar to Laguna of the Sierra de Tamaulipas which had domesticated plant remains. These people were basically agriculturists , with 40% of their subsistence coming from these activities, 51% from plant collecting and about 9% from hunting or trapping of animals. Domesticated plants included gourds, pumpkins, manihot, pepper, beans (large red variety), cottons, three races of hybridized corn Breve de Padilla, Dzit-Bacal and Nal-Tel and possibly earlier Nal-tel (unhybridized) types. (Possibly the other plants found in Mesa de Guaje exist at this stage also but our sample was too small to determine this).

This late Formative Phase is directly ancestral to Eslabones of the Sierra de Tamaulipas which overlaps with early Palmillas of the Sierra Madre roughly from 0 to 500 A.D. Since only Palmillas had preserved vegetal remains our reconstruction is based upon these materials. Domesticated plants included several varieties of corn, pumpkin, moschata and mixta squash, gourds, chili peppers, probably tobacco, runner beans, sunflowers, panicum, amaranths, manihot, lima beans, six varieties of common beans and cotton. Domesticated plants represented about 45% of their diet and wild plant collecting 50% while the remainder was from hunting or trapping of animals.

La Salta (500 to 900 A.D.) developed from Eslabones and if we can judge from late Palmillas remains which are very similar, it would seem that these subsistence patterns were about the same.

In the Sierra Madre, San Lorenzo developed from Palmillas but the regional equivalent has not been found in the Sierra de Tamaulipas. San Lorenzo 900-1300 A.D. has most of the domesticated plants of Palmillas but some of the varieties of Zea Mays and Cucurbita pepo as well as panicum, teoceuntli and sunflower are missing. Furthermore, agricultural foods

represent only 40% of their diet while 10% is from meat.

The final period (1300 to 1750 A.D.) sees the Los Angeles Phase in the Sierra de Tamaulipas and San Antonio in the Sierra Madre. Both of these last into historic times. Study of food reveal that these people obtained 40% of their food from agriculture, 42% from wild food plants and 18% from animals they hunted or trapped. Variety of domesticated plants are limited to one or two varieties of corn and beans, peppers, one variety of pumpkin (cucurbita pepo) and squash (cucurbita moschata) gourds, cotton, tobacco, indigo and possibly canavalia beans. The following chart outlines the occurence of domesticated plant remains in the Tamaulipas sequence.

Plan 1 material

Combined archaeological sequences from the Sierra de Tamaulipas and Sierra Madre of Tamaulipas

Dates	Los Angeles and San Antonio phases	Capsicum ___	cucurbita pepo(a number of races	Lageneria sic.	phaesolus vulgaris(C31 yellow seed var.)	zea mays (pollen in feces)	zea mays(early Nal-tel race	phaesolus v.(C33 long red seed variety)	zea mays (Bat cave race)	cucurbita moschata(various races)	grossivium ___	teocenti	zea mays (hybridized Bat Cave races)	helianthus ? ___	zea mays-Nal-tel race	zea mays Dzit-Bacal race	zea mays Breve de Padilla race	phaesolus v.(C32-small blac seed variety)	phaesolus lunatus(small va	cucurbits mixta	nicotina r.?	phaesolus vulgaris(C33a small red v ar.	indigaferia	canavalia ????????	opuntia	agave	phaesolus	coccineus	panicum sonorum	amaranths	manihot dulcis	bromelia
1750 A.D.																															
1300																															
900	San Lorenzo	x	x	x	x																										
500	LaSalta and late	x	x	x	x	x																									
0	Palmillas	x		x	x	x	x																								
500 B.C	Early Palmillas and Eslabones	x	x	x	x	x	x	x																							
1400	Laguna	?	x	x	x	x	x	x	x																						
1800	Mesa de Guaje	x	x	x	x	x	x	x		x																					
2200	Guerra	x	x	x	x	x	x	x			x																				
3000	Flacco and Almagre		x	x	x	x	x	x				x																			
5000	Laperra and late Ocampo		x	x	x	x	x	x					x																		
6000	Early Ocampo and Nogales		x	x	x	x	x	x						x																	
7000	Late Infiernillo		x	x	x	x	x	x						x																	
8500	Early Infiernillo		x	x	x	x	x	x						x																	
	Lerma																														
	Diablo																														

Plants potentially domesticateable but that were probablely used wild

were capable of such. Other plants capable of domestication, but for which we have no actual evidence that they were domesticated were panicum sonora (millet) that appear in feces from 5,000 B.C. through Palmillas 700 A.D., amaranths that occur in refuse and feces from Flacco (1,200 B.C.) times to historic times, and seeds and beans of manihot dulcis in the refuse from Laguna times (500 B.C.) through Palmillas times (700 A.D.). Also, occurring in the Laguna Phase were remains of Bromelia which in certain parts of Mexico were planted as hedges and their acid fruits eaten. However, their rarity in the Tamaulipas remains strongly suggests they were not planted here and were collected along with other wild forms. Some ~~Pucto short~~ pods that might ..... possibly be Canavelia occurred with Los Angeles remains but whether they are Canavalia is not certain.

Now let us turn to the plants that actually seem to have been domesticated. ~~The earliest two starting~~ Two of the earliest at 9,000 B.C. and leading to historic times are the gourd (Lageneria sic) and chili peppers, (capsicum frutescens). Both of these could have been useful weeds that were exploited but not planted. Some botanists, however, do not believe these plants occur ~~lonely~~ wild, but are either domesticated or plants that once were domesticated and have returned to a wild state. As far as Tamaulipas is concerned, both are rare or absent in a wild state and very frecuent in the archaeological remains. Thus I believe both were planted.

~~Almost~~ As early as these two plants are domesticated pumpkins (Cucurbita pepo). These first occur in ~~late~~ early Infiernillo levels, perhaps ~~8,500~~ 9,000 years ago and last until historic times. According to Whitaker and Cutler there were an increase of varieties of pumpkins through time. Unfortunately our archaeological material was not complete enough for them to set up actual races of cucurbita pepo in their analysis. In rough outline the sequence of varieties was as follows. In the beginning there was a small (seeded) pumpkin, during Occampo and La Perra times a slightly large seeded variety occurred with a narrow tapering pendancle.

In Mesa de Guaje a wide-rimmed seed variety occurred and the greatest diversity was reached in Palmillas when one or more varieties occurred ~~much~~ with not only different shaped seeds, but very different stems and body forms. Warty squash (cucurbita moschata) first occurred during Guerra times about 1,800 B.C. and walnut squash (cucurbita mixta) during Palmillas 300 A.D. ~~and~~ Both lasted up till at least 1300 A.D.

Following the earliest peppers, squash and gourds, are beans (phaesolus vulgaris). The first beans are a yellow seed variety (C 31) which occurs in early Occampo about 4,000 B.C., which are ~~slowly~~ short followed by a long red variety (C 33) at about 3,000 B.C. These lasted up until historic times. Since no wild beans have been found in Tamaulipas, it is assumed there were domesticated throughout their history even though in the earlier stages they were treated much like a wild plant, that is, pods and beans were chewed as ~~gourds~~ quids and ~~variety~~ mainly green beans, were utilized without being boiled. During Palmillas times 300 to 800 A.D. two other varieties of phaesolus vulgaris, a black bean (C 32) and a small red bean (C 33a) occurred along with lima beans (phaesolus ~~co~~ lunatus)

Occurring only a short time after the first beans is corn (Zea Mays). Its use starts about 3,000 B.C. and it lasts until today. Here again, new or distinctive races appear at different time periods. Unfortunately only the corn sequence from the Sierra de Tamaulipas has been completely studied though the ~~Acompañon~~ though pollen and silk cases in many cobs from the Sierra Madre are undergoing analysis. The earliest races are Early Nal-tel A and B, in Sierra de Tamaulipas at 3000 B.C. some cobs that are either of the Bat Cave race or closely related occur at about 2,000 B.C. in the Sierra Madre. Occurring at about 1,500 B.C. were found a number other varieties (races?) of corn showing teocenti intergression as well as actual grain of teocenti (though examples of one of its ancestors, tripiseum, occurred much earlier). Between 500 B.C. and the time of Christ Nal-tel, Breve de Padilla, ~~Diz~~ Dzit-Bacal were found. Other races may occur in later phases, but by late Pre-

historic ~~in~~ and historic times ~~hexvdekar~~ Brane ever de ~~Poclilla~~ Padilla type seems to have ~~bean~~ become dominant.

Besides these more well-known domesticated plants ~~and~~ occurred including: cotton (gossypium ?) from 1,800 B.C. to historic times; possibly sunflowers (helianthus) from 1,500 B.C. to 1,000 A.D.; possibly tobacco from 300 A.D. to historic times (nicotiana ~~rustica~~ rusticana ?)(here I say possibly tobacco for the leaves and stem fragments in pipes and cigaretts are small and difficult to identify accurately): And finally, evidence from dyed indigo blue fibre of fragments of woven cotton cloth indicate ~~of~~ indigofera suffruticosa ~~and three descicated pods of Canavalia from~~ was used in the period from 1,300 to 1,750 A.D.

Thus all in all twelve definite species or ~~genus~~ genera of domesticated plants occurred as well as more than sixteen races or varieties of these species. Furthermore, seven species ore ~~genesus~~ genera occurred ~~and~~ that could have been domesticated. In total there are at least 34/plant varieties in the 9,000 year sequence from southern Tamaulipas. ~~When~~ When these dated domesticated plantings ~~remains~~ from Tamaulipas are compared with other tentatively dated plant remains from North and South America, they throw considerable light upon the origin and diffusion of many New World plants. It is actually rather surprising how many areas have given us dated domesticated planting names in the New World. First and foremost are these from South America, ~~from~~ from Huaca Prieta and the other parts of the Peruvian sequence. Here we have a 5,000 year sequence of domesticated plants. Coming further north we have just a hint of domesticated plants from Santa Marta cave in Chiapas. In Central Mexico we have not ~~a hint of~~ found early domesticated plants. ~~And~~ The next area further north which produced is in Western Mexico in Sonora, ~~The~~ long cave sequence with plant remains southwest is, of course, abundant with preserved materials from caves; most of these are quite well dated. In the Hohokam area there is, of course, ~~Ventana~~ cave and Pine Bluff cave as well as others. In the Mollogon area there is Bat cave, Tularosa cave, Cordova cave, and the Hueco caves.

Adjacent to the ~~Magion~~ Mallagon remains are those from west Texas in the Big Bend area. ~~Unfortunately, most of these have not been described or dated very exactly.~~ Present work in this area is contributing valuable new important information. Turning westward from the southwest we have remains from Gypsum cave, Lovelock cave, and other California caves. Some of ~~them~~ these are again C14 dated, though they contained a fairly limited amount of domesticated plant remains. Going ~~further~~ east we have first the Caddo area. There are two sets of information ~~from these materials~~ from these regions, one being from the Ozark Bluff dwellers, and the other being from charred remains in open Caddo sites. Northward, in the great plains our materials ~~xxxx~~ is very limited being mainly charred material from at the earliest Sterns Creek and mainly Mississippi time period sites. The eastern United States again has produced relatively ~~little~~ LIMITED material. The earliest seems to come from Mamas Mammoth cave in Kentucky and seems to be archaic, in other words, it is probably older than 2,000 B.C. Many of the other Kentucky caves which ~~Wedeth~~ Webb noted seem to be of the ~~Indina~~ Adena time period. Other remains from the eatern United States come from open sites and are mainly charred materials, a few of which come from the Hopewell time level but most of them belong to ~~late ...~~ of the Mississippi time period.

Now let us take ~~twelve~~ some of the domesticated plants from Tamaulipas ~~and compare them in~~ what from their occurrance in other parts of the New World, The first plant we shall take is the common gourd (legeneriasic). Whitaker and Cutler have indicated that its ultimate origin probably is in Africa and that it probably floated across the Atlantic Ocean and ~~took hold~~ may have taken hold again in the soil along the edge of the Atlantic ~~Ocean~~ coast of the New World. As indicated in Tamaulipas it is at least 9,000 years old in the New World. In the eastern United States it is in the earliest levels, in Huaca Prieta it is in the earliest levels, and in the southwest it is in the earliest levels. ~~I~~ It is clear suggested that probably even during the Pleistocene gourds were floating across from the ~~Pacific~~ Africa? and taking hold along the Atlantic coast. With the invasion of men ~~at the beginning of food gathering times,~~ perhaps 9,000 years ago, ~~gourds were perhaps one~~ they began to be

~~of the first to be used.~~ ~~Their use, in turn,~~ spread from the Atlantic coast westward, ~~hitting the southwest perhaps at 3,000 B.C.~~, and probably the gourd was spread from the central part of the United States well down into western South America by this time period.

Chili peppers, that is capsicum frutiscens represent ~~another~~ problem. These are ~~definitely~~ wild in the New World, and wild chili peppers are spread from the American southwest well down into Brazil in South America. These also occur in the earliest levels in South America and in the earliest levels in Tamaulipas. In other words, there is considerable reason to believe that these were one of the first food plants gathered and perhaps planted, perhaps again, 9,000 years ago. Dressler has suggested that they probably were domesticated and used in a number of areas from Mexico down into Brazil. Certainly the archaeological evidence would seem to back this up. The plant itself, of course, needs very little cultivation and is actually treated very much like a wild berry anyway. Furthermore, the wild plant and the domesticated one are very difficult to tell apart, particularly from archaeological remains.

The next plant on our list, the pumkin, that is cucurbita Pepo. These occur in Tamaulipas at about 8,000 to 9000 years ago. They do not occur early in South America, nor did we find any in the caves in Chiapas in southern Mexico. However, they do occur in the earliest levels in the southwest of Bat Cave. They do not occur in Lovelock cave or other ~~likes~~ sites in the Great Basin. They are also absent from archaic remains in the Kentucky caves but do occur with ..... Since cucurbita Texana is considered to be the most closely related wild plant, since it occurred between the southwest and Tamaulipas, I would guess ~~that~~ Our Tamaulipas materials, particularly the small ~~feeds~~ variety, ~~are~~ very close to the to the center of origin of our first pumkins ~~and~~ Furthermore, ~~the~~ date of 8,500 years ago is not too far from the date when they were first planted and domesticated. I would guess, that by 5,000 B.C.

they spread into the southwest, particularly into the Maggione and Hohokam area. About a 1,000 B.C. these remains moved eastward across Texas into the eastern United States, and southward into the so-called Formative period of Mexico. At a much later date, perhaps 1,000 A.D. they moved into northern Arizona, and during Mississippi time moved out into the great plains. This is one of our best documented plants and also one, which I believe, we have some fair understanding of its origin and diffusion. The history of these, that is phaseolus Vulgaris, is not quite so well known. However, in this case an actual wild variety is known from Guatemala and southernmost Mexico. The early date of beans in Tamaulipas, that is about 4,000 B.C., suggests that beans were domesticated perhaps between 4,000 and 6,000 years ago in the Guatemala highland region. Our early date in Tamaulipas suggests that in pre-Formative time, that is roughly 3,000 to 4,000 B.C., they had spread over much of Mexico. By 1,000 B.C., they perhaps spread up from Tamaulipas into the Maggione area of the southwest. About the time of Christ there was a further spread across Texas into the eastern United States to appear in Hopewell and southward into Peru. By about 1,000 A.D. they again moved northward; this time out into the great plains and into the Iroquois area in the eastern United States.

Warty squash Cucurbita moschata represents an entirely different problem. It occurred in Tamaulipas and Peru about the same time, that is about 2,000 B.C. This is earlier than anywhere else for its occurrance in the New World. This suggests that its origin was somewhere between these two spots. As Dressler has stated, its greatest diversity is in Central America, and this may very well be its center of origin; on the basis of the dates for Peru and Tamaulipas we might guess that it was domesticated and first planted in that area about 3,000 B.C. Then it spread north and south, reaching Tamaulipas by 2,000 B.C. and Huaca Prieta in Peru at about the same time. Next it begins to spread into the southwest and

probably via the Rio Grande route and reaches the Anasazi via the Pecos River at about 1,000 A.D. After this date it probably spread southward into the rest of the southwest and ~~probably~~ also ~~across from~~ crossed Oklahoma and into Arkansas to ~~occur in~~ the Mississippi cultures in the eastern United States.

Now we come to the most important New World product, that is corn zea mays. (See Map) This, of course, was the basis for all New World civilization and was really the most important agricultural plant. As yet, we know very little of its ultimate origin in spite of the fact that we have now found wild corn pollen in the valley of Mexico probably during the last part of the ice age. At present our earliest archaeological evidence seems to come from Santa Marta, Chiapas, in southernmost Mexico. Here a single cob of a generalized primitive pods of pop has been found in a layer between 5,000 and 6,000 years ~~ago~~ old. This hints that probably in the same area there are even earlier types and that Chiapas is near the center of origin. The next earliest corn is to be found in Tamaulipas and the Southwest & Sonora at about 5,000 years ago. The former ~~This~~ is the early Nal-tel type, while at the ~~same time~~ latter from Sonora & New Mexico are a similar pod-pop type ~~is found~~ in the ~~southwest~~ called which is at Bat Cave. (race) This here suggests that the early Chiapas type become adapted to the mountains in one variety (the Bat Cave variety) and spread up to the southwest to ~~Bat Cave~~ New Mexico, while another variety of the early Chiapas type had become adapted to the lowland and spread up the Gulf coast to Tamaulipas. From 1,000 to 2,000 B.C. corn seems to have been spreading into western South America. At the same time, hybridized recently introgressed types began to appear in Mexico. These hybridized types in turn spread about 1,000 B.C. to the southwest. By the time of Christ a special flint-type of corn became developed in the Basket-Maker culture of Northeastern Arizona, and this in turn crossed to the eastern United States and arrived ~~there during~~ in Hopewell area about the time of Christ. At about 500 A.D. Nal-tel spread from Tamaulipas to the Alto Pecos of east Texas, while further hybridized types are spreading from Mexico into the southwest from the western part of Mexico. After 1,000 A.D. eastern corn types spread

into the northeast and up the Missouri into the Great Plain. Though we are a long way from knowing all the answers about the origin of the spread of corn, I think that we have at least a vague outline of such movements.

The next plant on our list is cotton Gossytium. As has been stated before, there were not only New World developping cotton but also Old World developping cotton. For the present we shall stick to our New World types. The earliest cotton that has been found sofar is at Huacaprieta in coastal Peru, its date from about 2,500 B.C. Probably it is much older in this area. It does not appear in Tamaulipas by about 1,700 B.C. Between 1,000 B.C. and the time of Christ one finger of cotton seems to have extended northward in the central plateau of Mexico into the southwest. Another finger at about the same time may have moved from Tamaulipas across Texas to join the Hopewell and other middle .... cultures of the eastern United States. Thus by the time of Christ, cotton seems to have reached its maximum distribution.

The next on our list as far as Tamaulipas is concerned is lima beans, that is phaesolus lunatus. Mackie has written quite a bit about the history of beans and seems to be correct in guessing that the place of origin was in Guatemala. Our first beans in Tamaulipas appear between 1,500 and 1,000 B.C. Thus the first spread of beans from Guatemala seems to be northward over much of Meso-America. A second root seems to move about 500 B.C. down to Peru. At about the time of Christ still a third finger moves out from Guatemala, southward and along the Carrabian, ... into Venezuela and out into the Carrabian Islands. The Mexican varieties at about 500 A.D. move up the Rio Grande to enter the Mollogon and Hohokam in the southwest. At about 1,000 A.D. lima beans spread northward into the Anasazi area of the southwest.

Sunflowers, that is helianthus probably have their origin in the southwest or between the southwest and the Ozark bluff dweller,

if the few seeds from the Ozark Bluff actually are pre-Pottery. Sunflower seeds appear in the earliest level of that cave which, I would guess, are about 3,000 B.C. I also would guess, that sunflowers first spread eastward into the eastern United States to appear in Adena and later in Hopewell. At about the time of Christ, sunflowers start their southward movement, arriving in Tamaulipas about 300 A.D. At a much later date, about 1,000 A.D. they probably move up the Missouri River into the Great Plains and also at the same time move into the northeastern United States.

Warty squash, that is cucurbita mixta occur in Tamaulipas and Ventana Cave in the southwest at about 300 A.D. On the basis of this distribution I would guess that somewhere about the time of Christ cucurbita mixta is domesticated in northwest Mexico. It probably spread from the Hohokoam area into northeastern Arizona about 1,200 A.D., and at the same time was spreading out of northern Meso-America into Guatemala.

Cannavalia occur extremely early in Peru at about 2,000 B.C. It reaches northern Tamaulipas or the southwest not until about 1,000 A.D. Thus I would suspect that here we have very, very slow movement of a plant from the islands of northern Peru.

The final plant we shall discuss is tobacco. The earliest tobacco that has been found sofar is from Adena Caves in Kentucky where it occurs at about 1,000 B.C. Working on the assumption that elbow pipes were used for smoking tobacco, we might guess that during the Hopewell period about the time of Christ, tobacco spread all over the eastern United States as well as up the Missouri River into the plains. At about 500 A.D., tobacco smoking may have moved to the Caddo area into northeastern Mexico and then spread into the coast of Mexico during the post-Classic period. Parallel with this movement would be a spread of tobacco from the eastern United States across Oklahoma and

SUMMARY (see charts)

Having rather sketchily outlined the hypothestical spread of a number of plants now let us look more closely at routes and times of contact between Mexico and the United States.

Route 1 - Southwest and Mexico via Rio Grande - This route seems to have been rarely used. In the two cases that it was employed it seems to have occurred early (before 4,000 B.C. and before 1,000 B.C.) The two plants involved are the pumpkin and sunflower and both look to be south-western domesticates rather than Mexican ones.

Route 2 - The Mexican and Southwest Central Plateau Route - This route also seems to have been an early one. The Mogollon early beans and cottons seem to have definately travelled along it. Early corn and perhaps later hybridized varieties might have also spread via this way but the evidence is not conclusive and the little we do know seem to favor the western Mexico route.

Route 3 - The Tamaulipas - Central Texas Route seems to be a middle time period way of contact. At about the time of Christ squash seems to have moved northward along it. Perhaps cotton, also moved into the east via this avenue though the possibility that it moved eastward from the Mogollon must not be forgotten. Somewhat later Nal-tel corn moved from Tamaulipas to east Texas while tobacco and pipe smoking moved in the opposite direction.

Route 4 - Western Mexico seems to have been a possible avenue in old time periods which became most important in the late phases. Pod pop corn seem to have move along it early (before 2,000 B.C.) while

hybridized corn moved along a little later (1,000 B.C. to 0) At about 500 A.D. walnut squash and lima beans seems to have moved northward along this route, while after 1,000 A.D. sieva and runner beans may have moved northward along it while tobacco and pipe smoking moved south.

number = no. only gathered
x = present but not counted
f = in feces

| Combined Cultural Phases | 1750 AD | | |

Barley – Movement of Carbohydrates in Plants – Brown Mullein

[Mexican, Southeastern and Southwestern ~~II~~ #27
Relationships as seen from the Standpoint
of the Spread & Origin of domesticated Plants]